



Learning From Others:

Anesthesia
Quality Institute

ANESTHESIA INCIDENT
REPORTING SYSTEM (AIRS)

A Case Report From the Anesthesia Incident Reporting System

Detailed review of unusual cases is a cornerstone of anesthesiology education. Each month, the AQI-AIRS Steering Committee will abstract a case and provide a detailed discussion based on a submission to the national Anesthesia Incident Reporting System. Feedback regarding this item can be sent by email to r.dutton@asahq.org. Report incidents to www.aqiairs.org.

Case 2013-9: A Case of Mistaken Identity

The patient is a 37-year-old G3P1 woman presenting for repeat caesarian section at 38 weeks and 6 days gestation. The patient has no relevant past medical history and has had an uneventful pregnancy. Spinal anesthesia is attempted, but despite return of CSF in the aspirate, there is no sensory level 10 minutes after injection. An epidural catheter is placed with some difficulty. A dose of 3% chloroprocaine is intended, but the patient instead receives clindamycin 90 mg (3 ml) due to the similar appearance of the syringes (see mock-up in Figure 1). The error was noted immediately, and the correct drug was given. The operation proceeded uneventfully, and the patient experienced no adverse effects in the perioperative period. Full disclosure of the error was made by the providers to the patient and her family.

Introduction

Medication error is a leading cause of patient morbidity and mortality. The Institute of Medicine estimates that hospitalized patients experience one medication error per patient per day. Medication error rates among ICU patients range from 1.2 to 947 errors per 1,000 patient days.¹ In operative anesthesia, reported rates are around 1 per 100 cases.² In a survey of nearly 700 anesthesiologists, Orser et al. found that 85 percent of providers admitted to at least one medication error in their career, with syringe swaps being the most common (70.4 percent), and administering muscle relaxant instead of reversal being the most common syringe swap.³ Fasting found a rate of one administration error every 900 anesthetics, again with syringe swaps being the most common, and muscle relaxant errors being the most common medication.¹ In one report, anesthesia providers were responsible for more than 80 percent of medication administration errors in a single hospital, a rate more than five-fold higher than the rest of the hospital.⁴ However, reported medication error rates by anesthesia providers vary widely (by several orders of magnitude), and

the operating room has been described as the “black hole of medication safety,” because we know so little about it.

Even less data exist on medication error rates for neuraxial anesthesia. More than 10 years ago, Hew identified 37 reported cases of inadvertent epidural administration of medications intended for I.V. use.⁵ A cursory literature search reveals a terrifying array of epidural and spinal medication administration errors, including muscle relaxants, antibiotics, magnesium, insulin, potassium and thiopental. Reverse errors occur as well, with intravenous administration of bupivacaine or other medications intended for the epidural space. Medication errors into the neuraxis are potentially more significant than those administered via I.V. The effects may not appear for hours or days and can include temporary neurologic deficit, permanent paralysis and death. A review of anecdotes suggests that administration of the wrong drug into the epidural space is generally less likely to produce a serious injury than injection into the intrathecal space, but there is always some potential for a very bad outcome.

Discussion

The submitter of the above case wrote that one should “ALWAYS read the label before administering a medication.” It is true that failure to properly identify the medication is a final common pathway for nearly all medication errors, but it is just as clearly true that recommending this action fails miserably as a high-reliability safety measure. One medication error per patient per day attests to this. Saying “be more careful next time” this frequently signifies a system in need of human factor improvements.

Anesthesia providers commonly use secondary cues (size of syringe, color of label or vial, location of syringe on the anesthesia tray) to choose the correct syringe, but these cues may decrease attention to reading the label and may facilitate, rather than prevent, certain medication errors. The Institute for Safe Medication Practices has published

warnings about the potential dangers of color coding.⁶ Fasting found no decrease in the number of medication errors after the implementation of colored syringe labels, although this study has provoked controversy.^{1,7} Color-coding, especially of classes of drugs, likely reduces the risk for some errors while increasing the risk for others. In the above case, the labels were not color-coded, but the syringes were both 20-ml and were placed in a kidney basin where the practitioner expected only the chloroprocaine to be (as per the mock-up in Figure 1).



Figure 1. Mock-up of syringes prepared for injection by the anesthesiologist, showing the type and style of the labels used.

The use of barcode scanning, especially if combined with synthesized voice reading of the drug name as a form of double-checking, offers a potential solution. These systems require the clinician to scan the medication vial, ampule or syringe before administration and confirm the dose in the electronic record. These devices are generally easy to use and well accepted by clinicians.⁸ Fedorko implemented a barcoding system in 20 operating rooms in a major Toronto hospital.⁴ Twenty nine near-misses were caught by the system in the first 60,000 doses given. After 23 months and more than 300,000 doses, there was not one medication error reported. While cost might be identified as a potential barrier to these systems, the authors claimed that the opposite is true, stating: “The process

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Table 1: Recommendations of the Anesthesia Patient Safety Foundation for avoiding medication errors in the operating room. Adopted from Eichhorn JH. APSF Hosts Medication Safety Conference. Consensus Group Defines Challenges and Opportunities for Improved Practice. APSF Newsletter. Spring 2010. 25:1.

1. Standardization of practice	
a.	High alert drugs (such as phenylephrine and epinephrine) should be available in standardized concentrations/diluents prepared by the pharmacy in a ready-to-use (bolus or infusion) form that is appropriate for both adult and pediatric patients. Infusions should be delivered by an electronically-controlled smart device containing a drug library.
b.	Ready-to-use syringes and infusions should have standardized fully compliant machine-readable labels.
2. Technology	
a.	Every anesthetizing location should have a mechanism to identify medications before drawing up or administering them (bar code reader) and a mechanism to provide feedback, decision support, and documentation (automated information system).
3. Pharmacy/Prefilled/Premixed	
a.	Routine provider-prepared medications should be discontinued whenever possible.
b.	Clinical pharmacists should be part of the perioperative/operating room team.
c.	Standardized pre-prepared medication kits by case type should be used whenever possible.
4. Culture	
a.	Establish a “just culture” for reporting errors (including near misses) and discussion of lessons learned.
b.	Establish a culture of education, understanding, and accountability via a required curriculum and CME and dissemination of dramatic stories in the APSF Newsletter and educational videos.
c.	Establish a culture of cooperation and recognition of the benefits of this paradigm within and between institutions, professional organizations, and accreditation agencies.

is orders-of-magnitude cheaper than alternatives, such as a satellite pharmacy, and it also puts us fully in compliance with the Joint Commission for injectable medication labeling in the O.R.” Barcode reading systems can improve medication administration safety but are not a panacea. Operator engagement and “buy-in” are still required to achieve the maximum benefit.⁹

In January 2010, the Anesthesia Patient Safety Foundation hosted a conference dedicated solely to the topic of medication safety.¹⁰ Recommended practice improvements are shown in Table I. Another source of recommendations can be found in the work of Professor Alan Merry, a member of the AIRS Steering Committee (and this year’s ASA/APSF Ellison C Pierce, Jr., Patient Safety Memorial Lecturer).¹¹

Recommendation 1a, regarding high-alert medications, is important. If it cannot be implemented in a particular setting, that practice should consider segregating all high-alert medications in trays lined with red or other brightly colored tape, keeping them in a separate drawer, even in a different storage area outside the O.R. Recommendations 1a and 3, regarding prefilled-premixed syringes, are controversial in a teaching setting. Intuitively, we may want trainees to have the experience of preparing medications in syringes and for infusion, including diluting medications in syringes, but must weigh this goal against a potential increase in errors. This is the tension between training and patient safety, and patient safety (of current rather than future theoretical patients) must win.

All the medication safety recommendations outlined above should help to reduce epidural medication errors. Needle, catheter and syringe connection redesign has perhaps the greatest potential to minimize these risks. The recommendation that epidural and I.V. connections be non-interchangeable was made more than a decade ago,¹² but there has been little progress since.¹³ Unique epidural connections are not available in the United States, and while they are available in Europe, their penetration of the market appears to be limited. Clinician acceptance of these devices is mixed in both the simulated environment^{14,15} and clinical practice.¹⁶ This could soon change. At least one manufacturer plans to focus efforts on working with the International Standards Organization to develop a universal design specification for non-Luer neuraxial connectors.¹⁷ An alternative approach is to prepare epidural syringes with a different kind of connector (a t-piece for example) as a visual cue to alert the provider to a potential error.

Summary

Medication errors can be physically destructive to patients and emotionally destructive to clinicians. Current efforts to modify human behavior (policy changes, re-education, dual signatures, equipment relocation, enhanced labeling,) have not been effective and are generally considered weak safety initiatives. Redesign of the equipment (different connectors), integration of information technology (bar-code scanning) and change of process (mandatory double-checks for high-alert medications) offer greater potential for improvement.

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For a complete list of references, please refer to the back of the online version of the ASA NEWSLETTER at asahq.org or email communications@asahq.org.